European Technical Assessment

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European Technical Assessment

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General Part

Technical Assessment Body issuing the European Technical Assessment:	Łukasiewicz Research Network – Institute of Ceramics and Building Materials
Trade name of the construction product	BOLIX CERAMICS EPS
Product family to which the construction product belongs	Kits for external thermal insulation composite system (ETICS) with panels as thermal insulation product and discontinuous claddings as exterior skin
Manufacturer	BOLIX SA Stolarska 8 34-300 Żywiec, POLAND
Manufacturing plant	BOLIX SA Stolarska 8 34-300 Żywiec, POLAND
This European Technical Assessment contains	21 pages including 3 Annexes which form an integral part of this assessment. Annex No 4 Control Plan contains confidential information and is not included in the European Technical Assessment when that assessment is publicly disseminated.
This European Technical Assessment is issued in accordance with Regulation (EU) No 305/2011, on the basis of	EAD 040287-00-0404

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Specific parts

1. Technical description of the product:

This product BOLIX CERAMICS EPS is a kit for External Thermal Insulation Composite System (ETICS) with panels as thermal insulation and discontinuous claddings as exterior skin – a kit comprising components which are factory-produced by the manufacturer or component suppliers. The ETICS manufacturer is ultimately responsible for all components of the ETICS specified in this ETA.

The ETICS kit comprises a prefabricated insulation product of expanded polystyrene (EPS) to be bonded with supplementary mechanical fixings (minimum bonded surface area – 80%) or to be mechanically fixed with supplementary adhesive, either through the insulation product and through reinforcement, onto a wall. The method of fixing and the relevant components are specified in Table 1. The insulation product is faced with a base coat consisting of one or more layers (site applied), one of which contains reinforcement and subsequently with exterior skin consisting of adhesive for claddings, cladding elements and grout. The base coat with exterior skin are applied directly to the insulating panels, without any air gap or disconnecting layer.

The ETICS may include special fittings (e.g. base profiles, corner profiles, expansion joints, sealing tapes and profiles) to treat details of ETICS (connections, apertures, corners, parapets, sills) and reinforcement elements (e.g. prefabricated mesh elements). Assessment and performance of these components is not addressed in this ETA, however the ETICS manufacturer is responsible for adequate compatibility and performance within the ETICS when the components are delivered as a part of the kit.

Table 1.

	Components	Coverage (kg/m²)	Thickness (mm)
	Bonded ETICS with supplementary mechanical fixings. National application documents shall be taken into account.		
Insulation materials with associated methods of fixing	• **Insulation product:** Boards of expanded polystyrene (EPS) according to EN 13163, white or graphite *Product characteristics - see Annex No 1*	-	40 to 350
	• **Adhesives:** - **BOLIX Z** cement based powder requiring addition of 0,19-0,21 l/kg of water	about 4,0 (powder)	-
	- **BOLIX U** cement based powder requiring addition of 0,20-0,22 l/kg of water	about 4,0 (powder)	-
	- **BOLIX UWM** cement based powder requiring addition of 0,20-0,24 l/kg of water	about 4,0 (powder)	-
	• **Supplementary mechanical fixings:** Plastic anchors covered by relevant ETA	-	-

Table 1. cont.

	Components	Coverage (kg/m²)	Thickness (mm)
	Mechanically fixed ETICS (through insulation product) with supplementary adhesive. National application documents shall be taken into account.		
Insulation materials with associated methods of fixing	• **Insulation product:** Boards of expanded polystyrene (EPS) according to EN 13163, white or graphite *Product characteristics - see Annex No 1*	-	50 to 350
	• **Anchors** *Products characteristics - see Annex No 2*	-	-
	• **Supplementary adhesives:** - **BOLIX Z** cement based powder requiring addition of 0,19-0,21 l/kg of water - **BOLIX U** cement based powder requiring addition of 0,20-0,22 l/kg of water - **BOLIX UWM** cement based powder requiring addition of 0,20-0,24 l/kg of water	about 4,0 (powder) about 4,0 (powder) about 4,0 (powder)	- - -
	Mechanically fixed ETICS (through reinforcement) with supplementary adhesive. National application documents shall be taken into account.		
Insulation materials with associated methods of fixing	• **Insulation product:** Boards of expanded polystyrene (EPS) according to EN 13163, white or graphite *Product characteristics - see Annex No 1*	-	50 to 350
	• **Anchors** *Products characteristics - see Annex No 2*	-	-
	• **Supplementary adhesives:** - **BOLIX Z** cement based powder requiring addition of 0,19-0,21 l/kg of water - **BOLIX U** cement based powder requiring addition of 0,20-0,22 l/kg of water - **BOLIX UWM** cement based powder requiring addition of 0,20-0,24 l/kg of water	about 4,0 (powder) about 4,0 (powder) about 4,0 (powder)	- - -

Table 1. cont.

	Components	Coverage (kg/m²)	Thickness (mm)
Base coats	• **BOLIX U** cement based powder requiring addition of 0,20-0,22 l/kg of water	about 4,0 or about 6,0* (powder)	3,0 to 5,0 or 4,0 to 6,0*
	• **BOLIX UWM** cement based powder requiring addition of 0,20-0,24 l/kg of water	about 4,0 or about 6,0* (powder)	3,0 to 5,0 or 4,0 to 6,0*
Reinforce-ment	• **Standard glass fibre meshes** applied in one or two layers		
	- **BOLIX HD 145/S**	-	-
	- **BOLIX HD 158/S**	-	-
	- **BOLIX HD 160/S**	-	-
	- **BOLIX HD 174/S**	-	-
	Products characteristics - see Annex No 3		
Adhesives for claddings	• **BOLIX SE** cement based powder requiring addition of 0,25 l/kg of water	about 4,0 (powder)	2,0 to 10,0
	• **BOLIX E** cement based powder requiring addition of 0,25 l/kg of water	about 4,0 (powder)	2,0 to 10,0
Claddings	• **Ceramic tiles** according to EN 14411 Water absorption ≤ 6 % Frost resistant acc. to EN 10545-12 Tiles area percentage in exterior skin area: 78,0 % ÷ 99,0 % Maximum area of a tile 0,36 m²	≤ 45 kg/m² (superficial mass)	6,5 to 20,0
	• **Natural stone tiles** according to EN 1469 Water absorption ≤ 9 % Frost resistant acc. to EN 12371 Tiles area percentage in exterior skin area: 78,0 % ÷ 98,0 % Maximum area of a tile 0,36 m²	≤ 45 kg/m² (superficial mass)	10,0 to 20,0

*depending on number of layers of glass fibre meshes

Table 1. cont.

	Components	Coverage (kg/m²)	Thickness (mm)
Grouts	• **BOLIX AQUASTOP** cement based powder requiring addition of 0,22-0,25 l/kg of water to be used with ceramic tiles Joints area percentage in exterior skin area 1,0 % ÷ 22,0 % Joint width 5 ÷ 15 mm***	about 0,5** (powder)	6,5 to 20,0
	• **BOLIX KL** cement based powder requiring addition of 0,11-0,12 l/kg of water to be used with natural stone tiles Joints area percentage in exterior skin area 2,0 % ÷ 22,0 % Joint width 5 ÷ 15 mm***	about 0,5** (powder)	10,0 to 20,0
Ancillary materials	• Impregnating coat **BOLIX BIK**, ready to use liquid to be used optionally on exterior skin, coverage: 0,10 to 0,50 kg/m² • Other according to EAD 040287-00-0404 Remain under the manufacturer's responsibility		

**regulated by thickness and joint width of the claddings; ***joint width shall be determined depending on the cladding element dimensions, taking into account the permissible tile to joint area ratio envisaged in the ETICS

2. Specification of the intended use in accordance with the applicable European Assessment Document (hereinafter EAD):

This ETICS is intended for use as external insulation of buildings' walls. The walls are made of masonry (bricks, blocks, stones) or concrete (cast on site or as prefabricated panels).

The ETICS can be used on new or existing (retrofit) vertical walls.

The ETICS is made of non load-bearing construction elements. It does not contribute directly to the stability of the wall on which it is installed, but it can contribute to durability by providing enhanced protection from the effect of weathering.

The ETICS is not intended to ensure the airtightness of the building structure.

The provisions made in this European Technical Assessment are based on an assumed working life of the ETICS of at least 25 years, provided that the requirements for the packaging, transport, storage, installation as well as appropriate use, maintenance and repair are met. The indication given on the working life cannot be interpreted as a guarantee given by the manufacturer or the Technical Assessment Body, but should only be regarded as a means for choosing the appropriate products in relation to the expected, economically reasonable working life of the works.

The works shall be executed by trained installers. Installation, maintenance and repair of ETICS shall be done in accordance with manufacturer's instructions and technical documentation.

Design, installation and execution of ETICS shall be in conformity with Member States' legislation requirements.

The instructions regarding packaging, transport, storage and installation of ETICS are specified in the manufacturer's technical documentation.

3. Performance of the product and references to the methods used for its assessment:

The performances of the kit as described in this chapter are valid provided that the components of the kit comply with Annexes No 1÷3.

3.1. Safety in case of fire (BWR 2)

3.1.1. Reaction to fire (EAD 040287-00-0404: clause 2.2.1, EN 13501-1)

Table 2.

Configuration	Max. heat of combustion MJ/kg	Flame retardant content	Euroclass acc. to EN 13501-1
Adhesive	0,32	No flame retardant	B-s1, d0
EPS boards* *density ≤ 25 kg/m³*	-		
Base coat	0,32		
Glass fibre mesh	8,61		
Adhesive for claddings	1,12		
Cladding**	-		
Grout**	0,53		
*flame retardant content in quantity ensuring Euroclass E according to EN 13501-1 **configuration for reaction to fire tests included impregnating coat BOLIX BIK (PCS: 24,57 MJ/kg)			

Note: European reference fire scenario has not been laid down for façades. In some Member States, the classification of ETICS according to EN 13501-1 might not be sufficient for the use in façades. An additional assessment of ETICS according to national provisions might be necessary to comply with Member State regulations, until the existing European classification system has been completed.

3.2. Hygiene, health and environment (BWR 3)

3.2.1. Water absorption by capillarity (EAD 040287-00-0404: clause 2.2.3)

- Base coat BOLIX U:
  - Water absorption after 3 minutes: 0,0 kg/m²
  - Water absorption after 1 hour: 0,1 kg/m²;
  - Water absorption after 24 hours: 0,5 kg/m².
- Base coat BOLIX UWM:
  - Water absorption after 3 minutes: 0,0 kg/m²
  - Water absorption after 1 hour: 0,2 kg/m²;
  - Water absorption after 24 hours: 0,5 kg/m².
- ETICS with cladding: Table 3.

Table 3.

		Water absorption (kg/m²) after		
		3 minutes	1 hour	24 hours
ETICS with cladding: Base coat BOLIX U + exterior skin (adhesive for claddings + cladding + relevant grout) indicated hereafter:	BOLIX SE + Ceramic tiles	0,0	0,0	0,4
	BOLIX E + Ceramic tiles	0,0	0,1	0,2
	BOLIX SE + Natural stone tiles	0,0	0,3	0,6
	BOLIX E + Natural stone tiles	0,0	0,3	0,5
ETICS with cladding: Base coat BOLIX UWM + exterior skin (adhesive for claddings + cladding + relevant grout) indicated hereafter:	BOLIX SE + Ceramic tiles	0,0	0,0	0,4
	BOLIX E + Ceramic tiles	0,0	0,1	0,3
	BOLIX SE + Natural stone tiles	0,0	0,1	0,5
	BOLIX E + Natural stone tiles	0,0	0,2	0,4

3.2.2. Water vapour permeability (resistance to water vapour diffusion) (EAD 040287-00-0404: clause 2.2.4)

Water vapour permeability for configurations of exterior skin with maximum (worst case) and minimum tile to joint area ratio has been assessed.

Table 4.

		EPS boards thickness (mm)	Water vapour diffusion resistance Z_{ETICS} [$(m^2 \cdot s \cdot Pa)/kg$]	Average equivalent air thickness $S_{d\ ETICS}$ (m)
ETICS with cladding: Base adhesive BOLIX UWM + EPS boards + base coat BOLIX UWM + exterior skin* (adhesive for claddings BOLIX SE + cladding + relevant grout) indicated hereafter:	Ceramic tiles *(max. tile to joint area ratio 0,99 : 0,01)*	40	$5{,}91 \cdot 10^{10}$	12
		50	$6{,}11 \cdot 10^{10}$	12
		100	$7{,}11 \cdot 10^{10}$	14
		150	$8{,}11 \cdot 10^{10}$	16
		200	$9{,}11 \cdot 10^{10}$	18
		250	$1{,}01 \cdot 10^{11}$	20
		300	$1{,}11 \cdot 10^{11}$	22
		350	$1{,}21 \cdot 10^{11}$	24
	Natural stone tiles *(max. tile to joint area ratio 0,98 : 0,02)*	40	$3{,}73 \cdot 10^{10}$	7
		50	$3{,}93 \cdot 10^{10}$	8
		100	$4{,}93 \cdot 10^{10}$	10
		150	$5{,}93 \cdot 10^{10}$	12
		200	$6{,}93 \cdot 10^{10}$	14
		250	$7{,}93 \cdot 10^{10}$	16
		300	$8{,}93 \cdot 10^{10}$	18
		350	$9{,}93 \cdot 10^{10}$	20
ETICS with cladding: Base adhesive BOLIX U + EPS boards + base coat BOLIX U + exterior skin* (adhesive for claddings BOLIX E + cladding + relevant grout) indicated hereafter:	Ceramic tiles *(min. tile to joint area ratio 0,78 : 0,22)*	40	$1{,}18 \cdot 10^{10}$	2
		50	$1{,}38 \cdot 10^{10}$	3
		100	$2{,}38 \cdot 10^{10}$	5
		150	$3{,}38 \cdot 10^{10}$	7
		200	$4{,}38 \cdot 10^{10}$	9
		250	$5{,}38 \cdot 10^{10}$	11
		300	$6{,}38 \cdot 10^{10}$	13
		350	$7{,}38 \cdot 10^{10}$	15
	Natural stone tiles *(min. tile to joint area ratio 0,78 : 0,22)*	40	$1{,}20 \cdot 10^{10}$	2
		50	$1{,}40 \cdot 10^{10}$	3
		100	$2{,}40 \cdot 10^{10}$	5
		150	$3{,}40 \cdot 10^{10}$	7
		200	$4{,}40 \cdot 10^{10}$	9
		250	$5{,}40 \cdot 10^{10}$	11
		300	$6{,}40 \cdot 10^{10}$	13
		350	$7{,}40 \cdot 10^{10}$	15

*configuration for water vapour permeability calculations included impregnating coat BOLIX BIK

3.2.3. Acceierated ageing behaviour (EAD 040287-00-0404: clause 2.2.5)

3.2.3.1. Hygrothermal behaviour (EAD 040287-00-0404: clause 2.2.5.1)

Pass (without defects).

Table. 5

		Bond strength after hygrothermal cycles (MPa)		Ratio: bond strength after hygrothermal cycles / bond strength in dry conditions
		Mean value	Min. value	
ETICS with cladding: Base coat BOLIX U + exterior skin (adhesive for claddings + cladding + relevant grout) indicated hereafter:	BOLIX SE + Ceramic tiles	0,15*	0,12	1,15
	BOLIX E + Ceramic tiles	0,14*	0,13	1,00
	BOLIX SE + Natural stone tiles	0,15*	0,13	1,15
	BOLIX E + Natural stone tiles	0,14*	0,12	1,08
ETICS with cladding: Base coat BOLIX UWM + exterior skin (adhesive for claddings + cladding + relevant grout) indicated hereafter:	BOLIX SE + Ceramic tiles	0,13*	0,11	1,00
	BOLIX E + Ceramic tiles	0,14*	0,11	1,00
	BOLIX SE + Natural stone tiles	0,14*	0,12	1,08
	BOLIX E + Natural stone tiles	0,14*	0,12	1,08

* 100% cohesive rupture in insulation

3.2.3.2. Freeze-thaw behaviour (EAD 040287-00-0404: clause 2.2.5.2)

ETICS is frost resistant according to water absorption test and freeze-thaw test.

3.3. Safety and accessibility in use (BWR 4)

3.3.1. Wind load resistance (EAD 040287-00-0404: clause 2.2.6)

No performance assessed.

3.3.2. Impact resistance (EAD 040287-00-0404: clause 2.2.7)

Table 6.

	ETICS with cladding: Base coat BOLIX U + exterior skin (adhesive for claddings + cladding + relevant grout) indicated hereafter:			
	BOLIX SE + Ceramic tiles	BOLIX E + Ceramic tiles	BOLIX SE + Natural stone tiles	BOLIX E + Natural stone tiles
	Hard body impact			
H1 (1 J)	-	-	-	-
H2 (3 J)	Skin not deteriorated	Skin not deteriorated	Skin not deteriorated	Skin not deteriorated
H3 (10 J)	Skin not deteriorated	Skin not deteriorated	Skin not deteriorated	Skin not deteriorated
	Soft body impact			
S1 (10 J)	-	-	-	-
S2 (60 J)	Skin not deteriorated	Skin not deteriorated	Skin not deteriorated	Skin not deteriorated
S3 (300 J)	Skin not deteriorated	Skin not deteriorated	Skin not deteriorated	Skin not deteriorated
S4 (400 J)	Skin deteriorated	Skin deteriorated	Skin deteriorated	Skin deteriorated
	Use category			
	Category II	Category II	Category II	Category II

Table 6. cont.

	ETICS with cladding: Base coat BOLIX UWM + exterior skin (adhesive for claddings + cladding + relevant grout) indicated hereafter:			
	BOLIX SE + Ceramic tiles	BOLIX E + Ceramic tiles	BOLIX SE + Natural stone tiles	BOLIX E + Natural stone tiles
	Hard body impact			
H1 (1 J)	-	-	-	-
H2 (3 J)	Skin not deteriorated	Skin not deteriorated	Skin not deteriorated	Skin not deteriorated
H3 (10 J)	Skin not deteriorated	Skin penetrated	Skin not deteriorated	Skin not deteriorated
	Soft body impact			
S1 (10 J)	-	Skin not deteriorated	-	-
S2 (60 J)	Skin not deteriorated	-	Skin not deteriorated	Skin not deteriorated
S3 (300 J)	Skin not deteriorated	-	Skin not deteriorated	Skin not deteriorated
S4 (400 J)	Skin deteriorated	-	Skin deteriorated	Skin deteriorated
	Use category			
	Category II	Category III	Category II	Category II

3.3.3. Bond strength (EAD 040287-00-0404: clause 2.2.8)

3.3.3.1. Bond strength between the base adhesive and the substrate (EAD 040287-00-0404: clause 2.2.8)

Table 7.

	Dry conditions		48 h immersion in water + 2 hours 23°C/50% RH		48 h immersion in water + 7 days 23°C/50% RH	
	Mean value (MPa)	Min. value (MPa)	Mean value (MPa)	Min. value (MPa)	Mean value (MPa)	Min. value (MPa)
BOLIX Z	0,95*	0,83	0,80*	0,65	0,98*	0,83
BOLIX U	0,94*	0,84	0,74*	0,66	0,97*	0,81
BOLIX UWM	0,89*	0,82	0,73*	0,62	0,91*	0,84

*100% cohesive rupture in adhesive

3.3.3.2. Bond strength between the insulation panel and the base adhesive (EAD 040287-00-0404: clause 2.2.8)

Table 8.

	Dry conditions		48 h immersion in water + 2 hours 23°C/50% RH		48 h immersion in water + 7 days 23°C/50% RH	
	Mean value (MPa)	Min. value (MPa)	Mean value (MPa)	Min. value (MPa)	Mean value (MPa)	Min. value (MPa)
BOLIX Z	0,10*	0,10	0,08**	0,08	0,12*	0,10
BOLIX U	0,12*	0,12	0,09**	0,07	0,12***	0,09
BOLIX UWM	0,13*	0,11	0,08**	0,08	0,13*	0,13

*100% cohesive rupture in insulation; **100% adhesive rupture; ***50% cohesive rupture in insulation / 50% adhesive rupture

3.3.3.3. Bond strength between external layers and the insulation panel (EAD 040287-00-0404: clause 2.2.8)

Table 9.

		Dry conditions		48 h immersion in water + 2 hours 23°C/50% RH		48 h immersion in water + 7 days 23°C/50% RH	
		Mean value (MPa)	Min. value (MPa)	Mean value (MPa)	Min. value (MPa)	Mean value (MPa)	Min. value (MPa)
ETICS with cladding: Base coat BOLIX U + exterior skin (adhesive for claddings + cladding + relevant grout) indicated hereafter:	BOLIX SE + Ceramic tiles	0,13*	0,12	0,10**	0,08	0,11*	0,11
	BOLIX E + Ceramic tiles	0,14*	0,12	0,10***	0,10	0,12*	0,11
	BOLIX SE + Natural stone tiles	0,13*	0,12	0,10***	0,08	0,12*	0,11
	BOLIX E + Natural stone tiles	0,13*	0,12	0,10***	0,08	0,11*	0,10
ETICS with cladding: Base coat BOLIX UWM + exterior skin (adhesive for claddings + cladding + relevant grout) indicated hereafter:	BOLIX SE + Ceramic tiles	0,13*	0,12	0,09***	0,08	0,12*	0,11
	BOLIX E + Ceramic tiles	0,14*	0,12	0,10***	0,10	0,12*	0,11
	BOLIX SE + Natural stone tiles	0,13*	0,10	0,10**	0,08	0,12*	0,11
	BOLIX E + Natural stone tiles	0,13*	0,12	0,09**	0,08	0,12*	0,11

*100% cohesive rupture in insulation; **100% adhesive rupture; ***50% cohesive rupture in insulation / 50% adhesive rupture

3.3.4. Tensile strength of the thermal insulation panel (EAD 040287-00-0404: clause 2.2.9)

See Annex No 1

3.3.5. Shear strength and shear modulus of the thermal insulation panel (EAD 040287-00-0404: clause 2.2.10)

See Annex No 1

3.3.6. Dead load behaviour (EAD 040287-00-0404: clause 2.2.11)

Table 11.

		Dead load behaviour	
		Dead load (N)	Displacement (mm)
	Bonded ETICS with supplementary mechanical fixings		
ETICS with cladding: Base coat BOLIX UWM + exterior skin (adhesive for claddings BOLIX SE + cladding + relevant grout) indicated hereafter:	Ceramic tiles	384*	11,7
	Natural stone tiles	360*	12,3
	Mechanically fixed ETICS with supplementary adhesive		
ETICS with cladding: Base coat BOLIX UWM + exterior skin (adhesive for claddings BOLIX SE + cladding + relevant grout) indicated hereafter:	Ceramic tiles	75	10,0
		80	11,7
	Natural stone tiles	73	10,0
		80	12,3

*maximum dead load applied

3.3.7. Pull-through resistance (EAD 040287-00-0404: clause 2.2.12)

Table 12.

Anchors for which the following failure loads apply		**Anchors according to Annex No 2**	
		Plate diameter (mm)	≥ 60
Characteristics of the **EPS boards** for which the following failure loads apply		Thickness (mm)	≥ 50
		Tensile strength perpendicular to the faces (kPa)	≥ 100
Failure loads (N)	Anchors not placed at the panel joints (*Pull-through test*) dry conditions	R_{panel}	Minimum: 442 Average: 460
	Anchors placed at the panel joints (*Pull-through test*) dry conditions	R_{joint}	Minimum: 423 Average: 450

3.3.8. Pull-out resistance (foam block test) (EAD 040287-00-0404: clause 2.2.13)

Table 13.

Anchors for which the following failure loads apply		**Anchors according to Annex No 2**	
		Supplementary plate diameter (mm)	≥ 60
Characteristics of the **EPS boards** for which the following failure loads apply		Thickness (mm)	≥ 50
		Tensile strength perpendicular to the faces (kPa)	≥ 100
Failure loads (N)	Anchors placed at the panel joints (*Static foam block test*)	R_{joint}	Minimum: 400 Average: 420

3.4. Protection against noise (BWR 5)

3.4.1. Improvement of airborne sound insulation (EAD 040287-00-0404: clause 2.2.14)

No performance assessed.

3.5. Energy economy and heat retention (BWR 6)

3.5.1. Thermal conductivity and thermal resistance (EAD 040287-00-0404: clause 2.2.15)

The thermal transmittance of the whole external wall covered by the ETICS is calculated in accordance with the standard EN ISO 6946:

$$U_c = U + \Delta U$$

where:

U_c: corrected thermal transmittance of the whole external wall, including thermal bridges (W/ (m^2·K));

ΔU: correction term of the thermal transmittance for mechanical fixing devices = $\chi_p \cdot n_{fix}$ (for anchors):

χ_p: point thermal transmittance value of the anchor (W/K) (see EOTA TR025). If not specified in the anchor's ETA, the following values apply:

- = 0,002 W/K for anchors with a plastic screw/nail, stainless steel screw/nail with the head covered by plastic material, and for anchors with an air gap at the head of the screw/nail;
- = 0,004 W/K for anchors with a galvanized steel screw/nail with the head covered by a plastic material;
- = 0,008 W/K for all other anchors (worst case);

n_{fix}: number of anchors per unit area (1/m^2)

U: thermal transmittance of the whole external wall, including ETICS, without thermal bridges (W/ (m^2·K)) determined as follows:

$$U = \frac{1}{R_{si} + R_{substrate} + R_{ETICS} + R_{se}}$$

where:

$R_{substrate}$: thermal resistance of the substrate wall in (m^2·K)/W

R_{se}: external surface thermal resistance in (m^2·K)/W

R_{si}: internal surface thermal resistance in (m^2·K)/W

R_{ETICS}: thermal resistance of whole ETICS in (m^2·K)/W:

$$R_{ETICS} = R_{skin} + R_{cladd\text{-}adhesive} + R_{base\_coat} + R_{insulatoin} + R_{base\text{-}adhesive}$$

where:

$$R_{skin} = R_{cladding} \cdot P_{cladding} + R_{grout} + P_{jointt}$$

and

$P_{cladding}$ = percentage surface of cladding element (%)
P_{joint} = percentage surface of joints (%)

Table 14.

Component	Thermal conductivity (tabulated value acc. to harmonized standard)		Harmonized standard with given tabulated value of thermal conductivity
	Min. value (W/m·K)	Max. value (W/m·K)	
Base adhesive	0,54	1,28	EN 1745
Insulation	0,037*	0,040*	EN 13163
Base coat	0,54	0,54	EN 1745
Adhesive for claddings	0,54	0,54	EN 1745
Ceramic tiles	1,3	1,3	EN 10456
Natural stone tiles	0,85	3,5	EN 10456
Grout	1,28	1,28	EN 1745

*assumpted values

General equation for thermal resistance of each material of the wall:

$$R = \frac{d}{\lambda}$$

where:

d: thickness of the material (m)

λ: thermal conductivity of the material [(m·K)/W]

Table 15.

		Thermal resistance R_{ETICS} with minimum thickness of EPS [(m²·K)/W]		**Thermal resistance R_{ETICS} with maximum thickness of EPS [(m²·K)/W]**	
		At minimum: value of thermal resistance and thickness of application of components	**At maximum: value of thermal resistance and thickness of application of components**	**At minimum: value of thermal resistance and thickness of application of components**	**At maximum: value of thermal resistance and thickness of application of components**
ETICS with cladding: Base coat BOLIX U or BOLIX UWM + exterior skin (adhesive for claddings BOLIX SE or BOLIX E + cladding + relevant grout) indicated hereafter:	Ceramic tiles	1,018	1,056	9,478	9,516
	Natural stone tiles	1,016	1,071	9,476	9,530

The value of thermal resistance of each insulation product shall be given in the manufacturer's documentation along with the possible range of thicknesses. In addition, the point thermal conductivity of anchors shall be given when anchors are used in the ETICS.

4. **Assessment and verification of constancy of performance (hereinafter AVCP) system applied, with reference to its legal base:**

According to the European Commission decision 97/556/EC amended by the European Commission decision 2001/596/EC, the AVCP system **2+** (further described in Annex V to Regulation (EU) No 305/2011) applies.

5. **Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD:**

The manufacturer shall perform a permanent internal factory production control based on the Control Plan.
The Control Plan for the manufacturer is specified in clause 3.2 of EAD 040287-00-0404 *Kits for external thermal insulation composite system (ETICS) with panels as thermal insulation product and discontinuous claddings as exterior skin*.
The manufacturer and Łukasiewicz Research Network – Institute of Ceramics and Building Materials TAB have agreed a Control Plan which is deposited at Łukasiewicz Research Network – Institute of Ceramics and Building Materials TAB in documentation which accompanies ETA.

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By

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Director of Łukasiewicz Research Network – Institute of Ceramics and Building Materials

Annexes:

Annex No 1 – Insulation products characteristics

Annex No 2 – Anchors characteristics for mechanically fixed ETICS with supplementary adhesive

Annex No 3 – Glass fibre meshes characteristics

Annex No 1 – Insulation products characteristics

		Boards of expanded polystyrene EPS white of graphite	
		Bonded ETICS with supplementary mechanical fixings	**Mechanically fixed ETICS with supplementary adhesive**
Reaction to fire / EN 13501-1		Euroclass – E max. density: 24,0 kg/m^3	
Thermal resistance		Defined in the CE marking in reference to EN 13163 (m^2·K)/W	
Thermal conductivity (λ_D) / EN 12667 / EN 12939		≤ 0,040 W/(m · K)	
Thickness / EN 823		± 2 mm [EN 13163 – T(2)]	
Length / EN 822		± 2 mm [EN 13163 – L(2)]	
Width / EN 822		± 2 mm [EN 13163 – W(2)]	
Squareness / EN 824		± 5 mm/m [EN 13163 – S(5)]	
Flatness / EN 825		5 mm [EN 13163 – P(5)]	
Dimensional stability under specified conditions	EN 1603	± 0,2 % [EN 13163 – DS(N)2]	
	EN 1604	2 % [EN 13163 – DS(70,-)2]	
Bending strength / EN 12089		≥ 75 kPa [EN 13163 – BS75]	≥ 100 kPa [EN 13163 – BS100]
Water vapour permeability, diffusion factor (μ) / EN 12086 – EN 13163		20 to 40	
Tensile strength perpendicular to the faces in dry conditions / EN 1607		≥ 80 kPa [EN 13163 – TR80]	≥ 100 kPa [EN 13163 – TR100]
Shear strength / EN 12090 – EN 13163		≥ 35 kPa	≥ 50 kPa
Shear modulus / EN 12090 – EN 13163		≥ 1 MPa	

Annex No 2 – Anchors characteristics for mechanically fixed ETICS with supplementary adhesive

Anchor trade name	Plate stiffness (kN/mm) / diameter (mm)	Characteristic resistance in the substrate
EJOT H1 eco EJOT H4 eco	0,6 / 60	ETA 11/0192
Ejotherm STR U 2G	0,6 / 60	ETA 04/0023
Insulation anchor Koelner TFIX-8S, Koelner TFIX-8ST	0,6 / 60	ETA 11/0144
Insulation suport TFIX-8M	1,0 / 60	ETA 07/0336
Rawlplug Facade Insulation Fixing R-TFIX-8M	1,0 / 60	ETA 17/0592
RAWLPLUG Insulation System R-TFIX-8S	0,6 / 60	ETA 17/0161
Koelner KI-10M	0,4 / 60	ETA-07/0291
KI-10N KI-10NS	0,5 / 60	ETA 07/0221
WKTHERMø8	0,6 / 60	ETA 11/0232
WKTHERM S	0,6 / 60	ETA 13/0724
fischer TERMOZ 8 U	0,5 / 60	ETA-02/0019
fischer termoz CN 8 fischer termoz CN 8 R fischer termoz CNplus 8	0,6 / 60	ETA-09/0394
fischer termoz CS 8	0,6 / 60	ETA-14/0372

Additionally, anchors covered by relevant ETA can be used, provided that they meet the following requirements:

	Requirement	
	Anchors* fixed through insulation product	**Anchors* fixed through reinforcement**
Plate diameter	≥ 60 mm	
Plate stiffness	≥ 0,4 kN/mm	

*anchors with pin made of steel shall be used

Annex No 3 – Glass fibre meshes characteristics

Mesh trade name		Description	Alkalis resistance	
			Residual resistance after ageing (N/mm)	Relative residual resistance: % (after ageing) of the strength in the as delivered state
BOLIX HD 145/S	R 117 A101	Mass per unit area: 152 g/m² Mesh size: 4,0 x 4,5 mm	≥ 20	≥ 50
	SSA-1363-145	Mass per unit area: 151 g/m² Mesh size: 4,5 x 3,8 mm		
BOLIX HD 158/S	ST 2924-100/7 KM	Mass per unit area: 155 g/m² Mesh size: 4,8 x 3,7 mm	≥ 20	≥ 50
BOLIX HD 160/S	03-1	Mass per unit area: 160 g/m² Mesh size: 3,5 x 3,8 mm	≥ 20	≥ 50
	SSA-1363-160	Mass per unit area: 165 g/m² Mesh size: 4,0 x 3,9 mm		
BOLIX HD 174/S	ST 112-100/7KM	Mass per unit area: 170 g/m² Mesh size: 4,0 x 3,7 mm	≥ 20	≥ 50

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